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ENERGY

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CENTRAL NAUGATUCK VALLEY
REGIONAL PLANNING AGENCY
20 EAST MAIN STREET
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ABSTRACT: This report presents an analysis of energy consumption by fuel types within the Central Naugatuck Valley Region. The tables present information on trends in the use of residential fuels, number of customers using gas and electricity in the Region, energy use by income level and energy use by sectors of the economy. Data contained in the tables include U. S. Census Statistics, Connecticut Light and Power Company and Public Utilities Commission data, and information from other sources.

Preparation of this report was principally the responsibility of Charles Vidich, Regional Planner

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XVI. ENERGY

1. INTRODUCTION

Historically one of the most compelling reasons for the existence and formation of cities has long been the economies of scale associated with the production and use of energy. Originally many cities were located near rivers in order to take advantage of the cheap and abundant energy supplied by rivers. Furthermore, cities located near rivers were able to reduce the cost of transporting goods from the place of production to market places in other cities. Reduced travel costs and travel times and improved communication associated with city life not only involved a more efficient use of energy but offered all urban residents a greater choice of goods for a cheaper price.

To some extent the positive economic advantages of city life which have historically supported a more energy efficient way of life were offset in the early part of this century by a decreasing cost of energy. The discovery of petroleum in the 19th century along with the development of suburban trolley lines and the invention of the gasoline powered motor vehicle in the late 19th century contributed to the suburbanization of many urban residents in the early 1900's. Reduced costs of energy coupled with reduced travel times allowed urban workers to move farther and farther away from their place of work in the central city trading off higher transportation costs for more pleasant surroundings. The suburbanization of the urban family throughout the early part of this century was followed and reinforced by the suburbanization of commerce and industry which has occurred in the post World War II years. In large part, the flight of urban dwellers to the suburbs has been made possible by a decreasing cost of energy used for transportation and decreases in commuting times from homes to place of employment.

However since 1973 as the cost of energy has begun to rise many individuals and firms have begun to reevaluate the costs and benefits of suburban life in light of the higher transportation costs associated with this style of living. Certainly the rising cost of gasoline has begun to play a greater role in housing location within the Central Naugatuck Valley Region and appears to be prompting those who are still committed to a suburban life style to use energy wisely (i.e., trading in their full size American car for a compact car or entering into carpools with their neighbors).

The Arab Oil Embargo of 1973 made Americans aware of the critical importance of energy to the American way of life. In particular, the energy crisis of 1973-1974 was severest for the New England states where there has traditionally been a heavy reliance on imported petroleum fuels. In 1972, 73.1% of the Connecticut supply of petroleum products was directly imported.[1] Furthermore, 78.8% of all of Connecticut's gross consumption of energy came from the use of petroleum products.[2] As can be seen from the Table below, Connecticut and New England are far more dependent on petroleum as an energy source than the nation as a whole.

Energy Sources Comprising Gross Consumption, 1972 (in percent)

Region	Anthracite	Bituminous Coal & Lignite	Petroleum	Natural Gas	Hydro & Nuclear
Connecticut	negligible	.5	78.8	9.1	11.6
New England	.1	1.2	84.6	9.1	5.0
United States	.2	17.1	45.7	32.1	4.9

SOURCE: Fuel and Energy Data, 1972, U.S. Department of the Interior, 1974.

According to a recent report of the Connecticut Energy Advisory Board in 1973 petroleum products accounted for 60.2 percent of all fuel consumed in the

[1] Connecticut Energy Advisory Board, Connecticut's Energy Outlook 1975-1994, 1975, p.II-7.
[2] Ibid. p.II-7.

residential sector, 70.5 percent of all fuel consumed in the commercial sector, 60.2 percent of all industrial sector consumption and 100 percent of all transportation fuel consumption.[3] In addition, petroleum products accounted for 78.5 percent of all the fuels consumed to generate electric power in 1973. Based on information from the U.S. Census, there is good reason to believe that the Central Naugatuck Valley is just as dependent on petroleum products as the state.

In 1973, the transportation sector accounted for approximately 35.8 percent of all the energy consumed within the state. Yet, while passenger cars account for 90 percent of the total number of taxable motor vehicles in the state, only 73 percent of all transportation energy consumption is attributable to passenger vehicles. 17 percent is attributable to trucks, 6 percent to aircrafts and the remainder to buses, railroads, vessels and the military.[4] As can be seen from Figure 1 in 1973 the gross energy consumed by the transportation sector was nearly twice that consumed by the State's industrial sector. This reflects a sharp growth in automobile ownership in the state during the decade of the sixties and a general decline in industrial growth throughout the state. Over the last decade while the percentage of energy consumed by the residential and commercial sectors of the state remained relatively constant, industrial sector consumption dropped from 25.3 percent to 18.2 percent of the total state energy consumption. This decrease was complemented by a corresponding rise in the percentage of the state's total energy consumed by the transportation sector. Between 1964 and 1973 transportation sector consumption increased its relative share of total energy consumption from 30.6 percent to 35.8 percent of the total.

In order to improve the future energy outlook of the State, the Connecticut Legislature created the Connecticut Energy Agency and the Connecticut Energy Advisory Board in 1974, under Public Act 74-285 in order to analyze future energy

[3] Ibid., p. II-9.
[4] Ibid., p. A-61.

demands and supplies in Connecticut.[5] In its First Annual Report the Connecticut Energy Advisory Board (CEAB) has recommended that efforts be made to decrease the state's reliance on imported petroleum products and increase its utilization of nuclear powered electric generating plants. In order to increase Connecticut's energy supply the CEAB has also encouraged efforts to burn solid waste as a supplementary fuel source for electric generating plants, utilize fuel cells for electrical power, explore offshore oil along the Atlantic Seaboard and promote solar energy as a residential space and water heating system.

Specifically in its First Annual Report to the Governor and General Assembly, the CEAB indicated that unless serious conservation measures are taken soon the state could be faced with insufficient supplies of oil as early as 1979 and of natural gas as early as 1984. The possible energy imbalance predicted for oil and natural gas in 1979 and 1984 are not expected to improve in any of the following years. These CEAB estimates assume that no efforts will be made to conserve fuel and that the state will continue to be dependent on petroleum products in the near future.

2. ENERGY USE IN THE REGION

Any possible reduction or curtailment of oil or natural gas supplies in Connecticut would have a severe effect upon the CNVR. As can be seen from Table I in the Waterbury SMSA, natural gas was used as a cooking fuel in 49.1 percent of all households, and as a home heating fuel in 26.1 percent of all households during 1970.[6] In addition, 67.1 percent of all households in the Waterbury SMSA used fuel oil to heat their house and 36.2 percent used it to heat water.[7] On the basis of a comparison of state estimates of fuels used for cooking, water heating and home heating, the Central Naugatuck Valley is just as dependent on scarce fuel sources (petroleum and natural gas) as the state as a whole.

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[5] Ibid., p. I-1.

[6] U.S. Department of Commerce, Bureau of the Census, Census of Housing. 1970 Detailed Housing Characteristics, p. 120, Table 45.

[7] Ibid.

2a. NATURAL GAS

However, the Region has a somewhat heavier reliance on natural gas than the state as a result of the fact that both major natural gas pipelines serving the state pass through the Central Naugatuck Valley Region. These are the Algonquin Gas Transmission Co. and the Tennessee Gas Co. The Algonquin Gas Transmission Co. passes through Southbury, Oxford, Naugatuck, Prospect and Cheshire while the Tennessee Gas Co. only passes through Cheshire. With the exception of Southbury and Bethlehem all of the municipalities of the Region are provided with natural gas through the Connecticut Light and Power Company, a subsidiary of Northeast Utilities System. While gas is provided to 11 of the 13 municipalities in the Region, 99% of the Region's gas customers reside in Cheshire, Naugatuck, Thomaston, Waterbury and Watertown.[8] Furthermore, as can be seen from Table V, Waterbury and Naugatuck alone accounted for 89 percent of all the gas customers in the Region at the end of 1974. The residential sector consumed the greatest amount of gas accounting for 45.1% of the total consumed in the 24 town CL&P district surrounding Waterbury during the 12 month period from March, 1974 to March, 1975. The Industrial sector consumed 39.3% of the total and the Commercial sector consumed 15.4 percent of the total. However, as can be seen from Table VI, the average consumption of electricity per customer in the 24 town CL&P district was far greater in the industrial and commercial sectors than in the residential sector. (See Table VII for a listing of the towns falling within the 24 town district). The average industrial customer consumed 8,433 Mcf of gas during the period from March 1974 to March 1975 while the average commercial customer consumed 351 Mcf and the average residential customer consumed 77.9 Mcf of gas. Furthermore, there is reason to believe that average customer usage of natural gas is higher in the urbanized areas of the Region than in the more rural towns. Table VII indicates that for industrial and commercial establishments the average natural gas

[8] Public Utilities Fact Sheet for 1974, Public Utilities Commission, May, 1975.

consumption is far higher in the seven town Waterbury subdistrict of CL&P than in the five town Naugatuck subdistrict or the thirteen town Winsted subdistrict. (See Table VII for a listing of the towns in each subdistrict). This is primarily due to the presence of large factories and commercial firms in the Waterbury area which tend to consume a greater amount of the natural gas than commercial and industrial establishments in the outlying rural towns.

2b. ELECTRICITY

The Region's electrical energy is primarily supplied by the Connecticut Light and Power Company which serves 12 of the Region's municipalities as well as 133 other municipalities in the state.[9] Only Thomaston is provided with electricity through a different company--that being the Hartford Electric Light Company.

ELECTRICAL TRANSMISSION LINES

The major electrical transmission lines passing through the Central Naugatuck Valley Region are presented in Figure II. The largest transmission line passing into the Region is the 345 KiloVolt line running from New York State to the Connecticut Yankee Nuclear Power Plant in Haddam Neck. This overhead line runs through the municipalities of Bethlehem, Watertown, Thomaston and Wolcott and connects into the electrical substation in Southington. A series of smaller 115 KiloVolt transmission lines originating from the Milford Steam Electric Station along the coast pass through Oxford, Middlebury and Waterbury with connector lines supplying current to two substations located in Naugatuck and Beacon Falls. One 115 KiloVolt line continues north passing through Wolcott enroute to Southington while another connects Waterbury with the northern substations of the Connecticut Light and Power district located in Torrington and Harwinton. Cheshire also has a 115 KiloVolt transmission line passing through its southern border which connects into an electrical substation in Meriden. The Region as a whole has 13 electrical substations located in seven of the thirteen municipalities

9 Annual Report of the Connecticut Light and Power Company to the Public Utilities Commission, 1973, p. 26.

with 5 of the 13 located in the city of Waterbury. Table VIII lists the 13 substations and their locations within the Region.

ELECTRICAL CONSUMPTION

Within the 24 town CL&P district surrounding Waterbury the greatest consumption of electrical energy was in the residential sector which accounted for 41.7 percent of the total electrical energy consumed between March 1974 and March 1975. The industrial sector was the second largest user of electricity with 34.3 percent of the total, the commercial sector accounted for 23 percent and street lighting in all 24 towns accounted for less than one percent of the total. (See Table VI). As with natural gas customers the average customer consumption of electrical energy was greatest among the industrial and commercial sectors. The average industrial firm in the 24 town district consumed 781.779 kilowatt hours, the average commercial firm consumed 39.575 kilowatt hours while the average residential customer consumed 7.367 kilowatt hours during the period 1974-1975. Furthermore, as can be seen from Table VII there was a greater average consumption of electrical energy in the seven town Waterbury subdistrict and in the five town Naugatuck subdistrict than in the thirteen town Winsted subdistrict. Once again this reflects the larger size of industrial and commercial firms in the Waterbury-Naugatuck area.

While oil and natural gas have been, and will continue to be, the primary fuels used in the residential, commercial, industrial and transportation sectors of the Region, electricity has been the fastest growing energy source over the last 15 years. In fact, between 1965 and 1971 the average residential use of electricity by Connecticut Light and Power Company customers increased more than any other electric company in the Tri-State Regional Planning Area (covering the New York City Metropolitan Area of New Jersey, Connecticut and New York). In addition, Northeast Utilities Systems estimates that electricity will supply an ever

increasing share of all energy consumed in the years ahead. It is estimated that in 1975 electricity will account for 12 percent of all end-use energy consumed in Connecticut but will account for 19.4 percent of the total energy consumption of the state by 1994.[10] In order to supply a greater share of the state's energy needs it is estimated that total electrical energy consumption will increase 115 percent between 1975 and 1994 while the demand for refined petroleum products will only increase 22.3 percent over the same period.[11]

However, it should be noted that a substitution of electricity for fuel oils in and of itself will not reduce the state's or the Region's reliance on petroleum products. In 1973, nearly 80 percent of the energy used to generate electricity came from residual or distillate oil.[12] Even with the present Northeast Utilities Systems' plans to construct 3 more nuclear power plants to serve the state by the 1986-1988 period, at most only 65 percent of all electricity generated in Connecticut is expected to come from nuclear power. The remainder will come from residual or distillate oils.[13]

While the increased reliance on nuclear generated electricity which is expected to occur in the future years may reduce the Region's dependency on petroleum products, electric energy will not be the most efficient use of energy. Presently, Resoure Planning Associates, Consultants on the 1975 CEAB Energy Plan estimates that approximately 70 percent of energy used to generate electricity is lost in the conversion process.[14] Even though electricity is the most inefficient source of energy the Connecticut Energy Advisory Board is encouraging its use partly on the basis of Northeast

[10] Connecticut's Energy Outlook 1975-1994, p. III-12.
[11] Ibid.
[12] Ibid., p. II-10.
[13] Annual Report of Northeast Utilities, 1973, p. 3.
[14] Connecticut's Energy Outlook 1975-1994, p. A-58.

Utilities Systems' present plans to build several nuclear powered generating plants within New England. In the future, the one major advantage of nuclear powered generating plants may be that the rising cost of electricity will be kept in check. The 1973 Northeast Utilities Systems Annual Report indicated that in 1973 the energy fuel cost of using residual oil to generate electricity was 2 cents per kilowatt hour while nuclear power cost only .2 cents per kilowatt hour or one tenth that of oil generated electricity.[15]

Table I clearly indicates that electric cooking and heating increased at a startling rate in the Waterbury SMSA between 1960 and 1970. There was a 17 fold increase in the number of households heated by electricity, an 82 percent increase in the number of households heating water by electricity, and an 88 percent increase in the number of households cooking with electricity in the Waterbury SMSA. In comparison, year round dwelling units increased only 16.3 percent during the same period.

In addition Table II indicates that more and more households in the Waterbury SMSA are using appliances that consume large quantities of energy. In 1973 the average residential consumption of electricity for customers in the Connecticut Light and Power Company (whose service area consists of most of Connecticut including the Central Naugatuck Valley Region) was 8,013 kilowatt hours per year. Residential customers of the Connecticut Light and Power Company used more electricity during 1973 than any of the customers of the nine electric utility companies serving the Tri-State Region.[16] The reasons for the higher usage of electricity by Connecticut Light and Power Company customers may be due to the higher per capita income of Connecticut residents and the suburban nature of the State. Higher income suburban residents tend to have more appliances and consume more electricity than lower income urban residents. As can be seen from Table III, the percentage

[15] Annual Report of Northeast Utilities, 1973, p.3.
[16] Tri-State Regional Planning Commission, Historical Trends in Electric Energy and Fossil Fuels, 1973, p.5.

of households in the Waterbury SMSA with air conditioners, dishwashers, home food freezers, clothes dryers and automatic clothes washing machines increases with increasing income levels. If these appliances can be used as a proxy for residential electrical consumption it appears that electrical consumption increases with increasing income levels. As an example in 1970, 11.2 percent of those earning less than $3,000 had an air conditioner while 43.3 percent of those earning $25,000 or more had an air conditioner. It appears that as incomes rise individuals are more apt to substitute air conditioners for fans thereby increasing their consumption of energy. As can be seen from Table IV, air conditioners use anywhere from 4 to 20 times as much energy annually as fans. In addition upper income residents consume more energy through the use of home food freezers, clothes dryers and dishwashers for which there are no comparable appliance substitutes for lower income residents. In fact the use of these three appliances is a substutute for the more efficient energy uses of (1) manual labor (in the case of dishwashing), (2) solar energy (clothes drying) and (3) shopping trips to the grocery store (home food freezer). This not only implies that upper income residents are the more lavish users of electrical energy but that they ought to make a greater effort to conserve energy than the Region's poor.

Assuming that no major efforts are made to conserve electricity, the Northeast Utilities System predicts that by 1983 the average use per customer will be 11,618 kilowatt hours a year or a projected 54 percent increase in electricity consumption in 11 years.[17]

2c. Transportation

Similarly in the transportation sector energy use has grown and is expected to continue growing at an alarming rate. Between 1964 and 1973 there was a 46 percent increase in energy consumed in the transportation sector of the

[17] Northeast Utilities System, Ten and Twenty Year Forecasts of Loads and Resources, January 1, 1974, p.20.

state and the CEAB makes a conservative estimate that consumption of energy for transportation will increase 28 percent between 1974 and 1994.

The large increase in energy consumed by the State transportation sector was in large part due to the phenominal growth in the number of registered automobiles. Between 1960 and 1970 there was a 54.3% increase in the number of registered automobiles in the state and a 50 percent increase in the number of registered automobiles in the Region.[18] On a Regional basis the growth in auto ownership has meant that 85.1% of all the Region's households had a automobile available in 1970 and as many as 47.4% had two or more automobiles. (See Table IX). This has made the automobile the primary form of travel within the Region.

As the following Table indicates the vast majority of the Region's residents (83.6%) rode by car when going to work in 1970 while only 6.0% went to work by bus and 0.2% went to work by railroad. The heavy reliance on automobiles has contributed to a highly inefficient use of energy in the Region. According to a Tri-State Regional Planning Commission report a full size automobile travels 15 passenger miles per gallon, a commuter train travels 100 passenger miles per gallon and a bus 110 passenger miles per gallon.[19]

Total Persons at Work During Census Week by Means of Transportation in the CNVR: 1970

	Private Auto Driver	Private Auto Passenger	Bus	Railroad	Taxi	Walked	Worked At Home	Other
	62,469	11,019	5,235	190	128	6,149	1,461	1,267
Percent of Total Trips	71.1	12.5	6.0	0.2	0.1	7.0	1.7	1.4

Furthermore, since these estimates of the efficiency of trains and buses are based on average loadings, it can be expected that the energy efficiency of buses or trains will increase as more passengers are carried per vehicle. For

18 Connecticut Market Data 1974/75, Connecticut Department of Commerce, p. 89.

19 Tri-State Regional Planning Commission, The Economics of Energy, February 1974, p. 11.

those residents of the Region who do not have the option of using mass transportation sizable energy and cost savings can be realized through the use of more compact, lighter weight automobiles and/or carpooling. As of 1970, 48.2 percent of the Region's residents worked in a different municipality than their place of residence.[20] In addition, residents of the suburban municipalities tended to travel further than residents of Waterbury. According to 1970 census data only 28.7 percent of Waterbury residents worked outside of Waterbury while 67.3 percent of all residents of the suburban municipalities worked in a municipality other than their municipality of residence.[21] These statistics indicate that Waterbury tends to promote more energy efficient land uses than the suburban municipalities since it offers greater employment and shopping opportunities within a shorter distance of home and provides a larger number of energy efficient transportation options (i.e., buses, mini buses, walking and trains) to a greater number of people.

However, for mass transit to be a viable transportation alternative within the Region, efforts must be made to cluster residential and commercial development in order to make the cost of bus or rail service more economical to the user and more profitable to the provider. At present, one of the two out-of-town bus routes operated by Northeast Transportation Company is being operated at a loss.[22] This is in part due to the fact that residents of the suburban municipalities do not patronize local bus service because they find it to be inconvenient because of limited scheduling and advertising and perceived high cost ($.85) of bus travel. One method of making bus service more efficient and flexible would be to provide mini bus service to those suburban municipalities that do not generate a sufficient number of passengers to make use of 40 passenger buses profitable. Certainly, if mini bus service were to be coordinated with Northeast bus routes, the

[20] Connecticut Department of Transportation, 1970 Census of Journey to Work, (October 1973) based on U.S. Bureau of Census data from 1970 Census of Population.

[21] Ibid.

[22] State of Connecticut Department of Transportation, Operational Review of Northeast Transportation Co., Inc., Report of Findings and Recommendations, February, 1975, Exhibit XVII.

Region could be provided with a more energy efficient bus service at a more reasonable cost.

The transportation of freight is an additional sphere in which energy conservation measures are needed. Presently, most freight coming to or going out of the Region is handled by trucks with very little moved by railroads. Similarly, within the Region the movement of goods is handled almost exclusively by trucks. The positive advantages of truck transport for short distance hauls is clear in light of low density development of business and industry throughout the Region making the provision of rail service uneconomical. However, for long distance hauling, the railroad is the most efficient freight mover. According to the United States Railway Association's Preliminary System Plan of 1975, truck freight consumes over three times as much energy per ton mile as rail freight.[23] Moreover, the longer the trip and the heavier the load to be moved the more efficient it is to move goods by rail compared to truck.

Suburban sprawl and low density residential development not only makes the provision of bus and rail service uneconomical but tends to increase the cost and the consumption of energy in the home. Single family homes consume more energy in space heating than multi-family structures and utilize more appliances than multi-family structures. Since many multi-family structures often provide tenants with communal appliances in the basement these individuals tend to use these appliances more efficiently (e.g., waiting until they have a full load to do their wash). In contrast to the higher energy consumption of suburban homes for space heating, urban dwellings tend to be more energy efficient since many urban dwellings share common walls, decreasing the exposure to the exterior. However, another overlooked reason is that urban areas as a whole generate heat islands which may substantially increase the temperature of an urban climate over its rural and suburban surroundings. While there is no data available on the annual temperature differences between Waterbury and the surrounding Region, on the basis of

23 United States Railway Association, Preliminary System Plan, February 26, 1975, Washington, D.C., pp. 148 and 153.

findings in other American cities there is reason to believe that urban temperatures may average 1 to 2 degrees centigrade higher than rural temperatures.[24] In the winter the temperature difference between cities and rural areas is attributable to several factors: combustion for home heating, transportation, industry and human metabolism. However, in the summer, cities tend to be hotter than the surrounding rural areas because of the increased solar radiation stored by concrete buildings, pavement and other stone surfaces. One positive advantage of this urban heat island phenomena is that urban residents need less energy to heat their homes than residents in the surrounding rural and suburban area. On the other hand, more energy is needed for cooling in the summer because natural cooling systems such as forests and vegetation are not able to compensate for the heat generated by street paving and the amount of stone surfaces in urban areas. According to one urban ecologist, one way of reducing the heat island effect in the summertime would be to plant more trees throughout the city. One large mature maple tree is capable of cooling nearby ambient air as effectively as five large air conditioners. The benefits of this approach to urban air conditioning are twofold: (1) the aesthetics of urban environments are enhanced and (2) summertime energy consumption used for cooling is reduced to a minimum. Even if a city's park department should decide not to reforest its urban areas, there is reason to believe that urban areas are still more energy efficient on a year round basis because of the large energy savings made during the winter months. According to a report prepared by Arthur D. Little, Inc., the increased energy consumed for cooling urban areas is offset by considerably larger energy savings of heating homes in the winter.[25]

3. CONSERVATION

While every effort possible should be made to assure a continued supply of energy to the Region, it is equally important to develop programs designed to curtail the

[24] James T. Peterson, The Climate of Cities: A Survey of Recent Literature, U.S. Department of Health, Education and Welfare, October, 1969, p. 11.

[25] Connecticut's Energy Outlook 1975-1994, p. D-30.

growing per capita usage of energy. Over the last 15 years per capita energy usage has increased in the Region and the state as individuals have moved out to single family homes in the suburbs, increased their commuting distance to work and increased the use of electrical appliances.

In the years ahead, there is good reason to believe that the average cost of heating in the wintertime may rise even more than that experienced over the last three years. In part, the mild winters of the last three years lessened the cost of heating homes since temperatures have been considerably higher since 1972 than in the ten year period from 1964 to 1974. According to the Connecticut Energy Agency, the number of degree days in the 1972 to 1973 winter was 9.5 percent less than the ten year average, and, in 1974-75, it was 2.9 percent less than the ten year average. A degree day is the difference between 65 degrees Fahrenheit and the average daily outside temperature. As an example, if the outside temperature is 35 degrees Fahrenheit the number of degree days is 30. The table below indicates the degree day data for the last three winters as compared to the period 1964 to 1974.

Degree Days In Connecticut: 1972-1975

Degree Days	Year	Percent Below 10 Year Average
5700	1972-73	6.6
5520	1973-74	9.5
5920	1974-75	2.9
6100	10 year average 1964-1974	---

Source: Connecticut Energy Agency, May, 1975.

The implication that can be made from the degree data for the past three years is that voluntary energy conservation measures may be more difficult to implement in the years ahead if winter temperatures return to levels like those found during the period 1964 to 1974.

If energy conservation measures are dependent upon the consumer's willingness to restrict his or her level of comfort or convenience it is expected that there may be some resistance to cutting back on energy use. While reducing speed limits,

reducing temperature settings and using electrical appliances more sparingly can all be effective techniques of conserving energy, economic incentives for the conservation of energy (or economic disincentives for excessive use of energy) may be the only effective solution. To some extent the recent price hikes on all petroleum products has given consumers more reason to conserve on energy. The increasing price of petroleum products has increased the demand for compact automobiles offering higher fuel economy, increased the number of people using carpools and increased the demand for home insulation products in order to cut down on heat loss.

The CEAB has suggested that a tax be placed on automobiles in proportion to its fuel economy. Those automobiles which are the least efficient would be taxed the most while those which are the most efficient would be taxed the least. In addition, the CEAB has suggested that an economic incentive be given to those insulating their home by allowing them to deduct the cost of purchasing the insulation from their income tax. Tri-State Regional Planning Commission estimates that energy requirements for heating and cooling in new housing construction can be reduced 40 to 50 percent from the present standards by improved levels of insulation.[26] In order to insure that energy is conserved in all housing, including apartment dwellings where tenants may not have an incentive to insulate or conserve heat, the CEAB is encouraging the state to require improved insulation as part of the State Building Code. Other equally important measures recommended by the CEAB are (1) that the Federal government require that all electrical appliances be labeled with their consumption of electricity plainly displayed on the item, (2) industry should be encouraged to locate near electric generating plants to utilize the waste heat created by the conversion process, (3) encourage multi-family housing developments and (4) encourage clustered residential and commercial developments.

Certainly, all energy conservation measures (such as economic disincentives for the

[26] Tri-State Regional Planning Commission, The Economics of Energy, February, 1974, p. 9.

use of energy) tailored to the Region or the State must also consider any possible adverse social, economic and environmental effects created by reducing energy consumption or increasing the efficient utilization of energy. Perhaps the major issue is to what extent will energy conservation have an adverse effect on the economy of the Region. Northeast Utilities System has indicated that reduced electrical consumption will conserve energy but will also tend to increase the cost of electricity. Similarly while the gasoline price hikes have cut down on fuel consumption they are also driving up the cost of living for most of the Region's residents. Those who are hurt by increasing energy costs are the low income families of the Region living on marginal incomes. These families pay a greater share of their total income for home heating, electrical utilities, automobile maintenance and operation and other energy needs than the rest of the Region's population. As an example, a recent survey by New Opportunities for Waterbury (NOW) found that individuals relying on fixed incomes such as social security, public assistance or unemployment compensation may spend 32 to 36 percent of their income on heat and utilities while salaried individuals spend less than 20 percent of their income for the same items.[27] In order to assist families and individuals who are unable to pay their heat and utility bills and to insure that they are provided with heat and utilities, NOW, Inc., has established an Emergency Fuel Assistance Program which provided loans to those in need. While little statistical information exists to confirm the findings of NOW, Incorporated's survey there is ample reason to believe that the rising prices of home heating fuels and electricity are becoming an increasing burden for the Region's low income population.

27 Now, Incorporated, Those Who Pay for Heat and Utilities, 1975, Table 1.

4. Alternative Energy Systems

There are a multitude of energy sources that may some day supplement or replace petroleum and natural gas in the next thirty years. Nuclear power is perhaps the most commonly thought of alternative energy source available within the state promising to become a greater source of power in the years ahead. However, other less well known energy sources such as solar energy, windpower, nuclear fusion, geothermal energy and fuel cells may also become significant suppliers of energy by the end of the century.

Perhaps the most attractive energy systems for the Region and the state are solar energy and windpower. These two energy systems offer a virtually limitless source of energy with virtually no adverse effect upon our air and water resources. Furthermore, one unique advantage of solar energy or windpower is that these systems can be constructed and operated by individual home owners as a supplement or as a total replacement to fuel oil or electrical heating. At the present time, one private home owner in Connecticut has been able to reduce his fuel oil heating bill by 66 percent through the use of solar heating panels as a supplement to his fuel oil burner, along with the installation of more effective insulation and the use of a better building design. While it is possible to totally replace the use of a fuel oil burner with solar heating panels, the cost of such a solar heating unit is much more than a unit that merely supplements an existing fuel oil burner. Another recent project to construct a solar heated, wind-powered house in Guilford, Connecticut envisions that 70 percent of all heating may be achieved through solar heating and 80 percent of the electrical needs of the home could be supplied by two windmills in the backyard of the home. While this project has been temporarily stalled because of problems with local ordinances prohibiting the erection of structures over 50 feet in height, it may be a sign of what is to come in other towns as well.

The success of these alternative energy systems as a replacement for oil or electricity is contingent upon many factors of which cloud and wind conditions are

probably the most important. Variations in the micro climate surrounding a home, its orientation to the sun, its proximity to water bodies and the quality of the solar heating equipment can all have a considerable influence on the efficiency of solar heating units. The Connecticut Energy Agency has indicated that local home owners interested in solar heating must be extremely careful not to overestimate the capabilities of solar heating in Connecticut since the commercial units presently available on the market have a wide range of capabilities and a wide range of reliability.

At the present time, 39 companies within the United States are marketing solar heating units and only 6 major companies in the world are marketing windmills. Of these six major windmill manufacturers only two are located within the United States. Small windmills are available on the market within the United States but at present large windmills are only manufactured in Switzerland. Since windmill technology, as it is applied to on-site residential use, is limited to areas with sufficient year round wind, it may not be a viable option for many home owners in the CNVR.

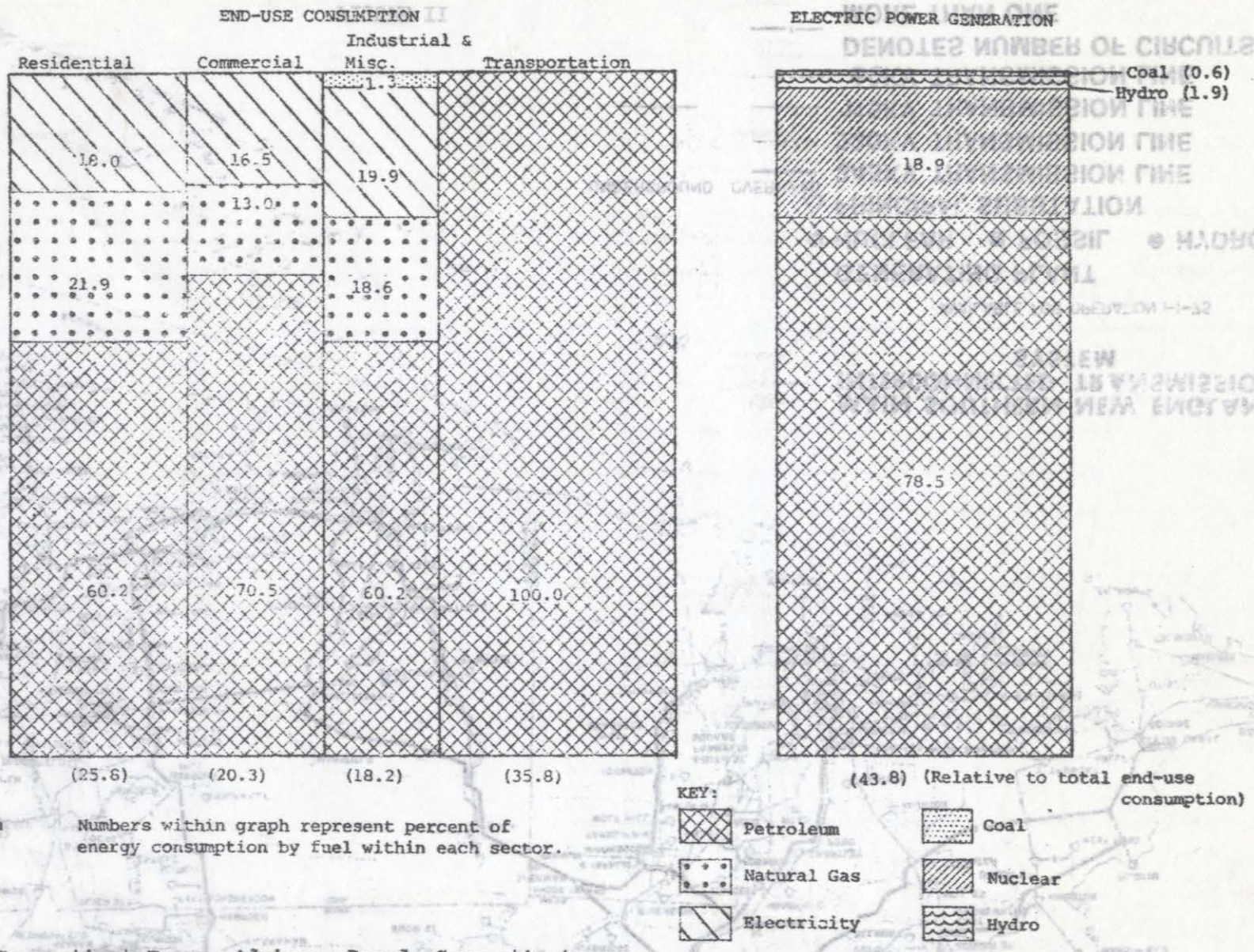
In contrast to the small scale do-it-yourself windmills, some scientists have envisioned one large scale windmill that would not be dependent upon the vicissitudes of local inland winds. During periods of calm the windmill could provide energy from storage subsystems thereby offering continuous power throughout the year. One such system was proposed for offshore Long Island capable of supplying all the electric energy for New England, but as of yet has not proved feasible because of the capital investment required and the technology necessary to undertake the project. In contrast to windpower, solar energy may soon be offering many options to residents of the Region and the State. In the Fall of 1974, Congress passed four Acts which may very well facilitate and accelerate the development and widespread introduction of solar heating in America. The Solar Energy Research and Development and Demonstration Act of 1974, the Solar Heating and Cooling Demonstration Act of 1974 and the Federal NonNuclear Energy Research and Devel-

opment Act of 1974 are specifically designed to stimulate the development of solar heating prior to the year 2000. Monies are being made available to builders and construction companies to pay for the cost of installing solar heating units so as to accelerate the use of this heating system as soon as possible. Already there is one demonstration project being undertaken in Hamden, Connecticut which will be heated by solar energy. As many as four other solar heated houses exist in the state but as of yet there are none in the Central Naugatuck Valley Region.

Solar heating is not a total answer to electricity or fuel oil heating but it does provide an opportunity of reducing our dependence upon scarce fuels. For the individual home owner sizable savings could be made by using solar heating panels since as much as 65 percent of the energy consumed in Connecticut's residential sector goes to space heating. However, it may take some time before this system of home heating becomes popular because at the present time solar heating units cost between $4,000 and $6,000 to purchase and install in a $40,000 house. Furthermore, the size and the cost of solar heating equipment will vary with the size and the square footage of the home; larger homes requiring larger and more expensive units than small homes. Certainly $6,000 is a sizable investment to make for a new home, especially with rising land and construction costs. However, despite the high cost of these units, Tri-State Regional Planning Commission estimates that if fuel and electricity costs increase at an average rate of 8 percent and prices increase at an average annual rate of 4 percent, solar heating may come into extensive use by 1993 in most areas of the United States. By 1993, the initial investment in solar heating equipment will outweigh the long term costs of purchasing scarce fuels and fuel oil burners for home heating. Certainly, the abundance and relative simplicity of solar heating makes it an important alternative form of energy in the years ahead.

FIGURE I

CONNECTICUT FUEL CONSUMPTION BY SECTOR, 1973



Source: Connecticut Energy Advisory Board, Connecticut s Energy Outlook 1975-1994

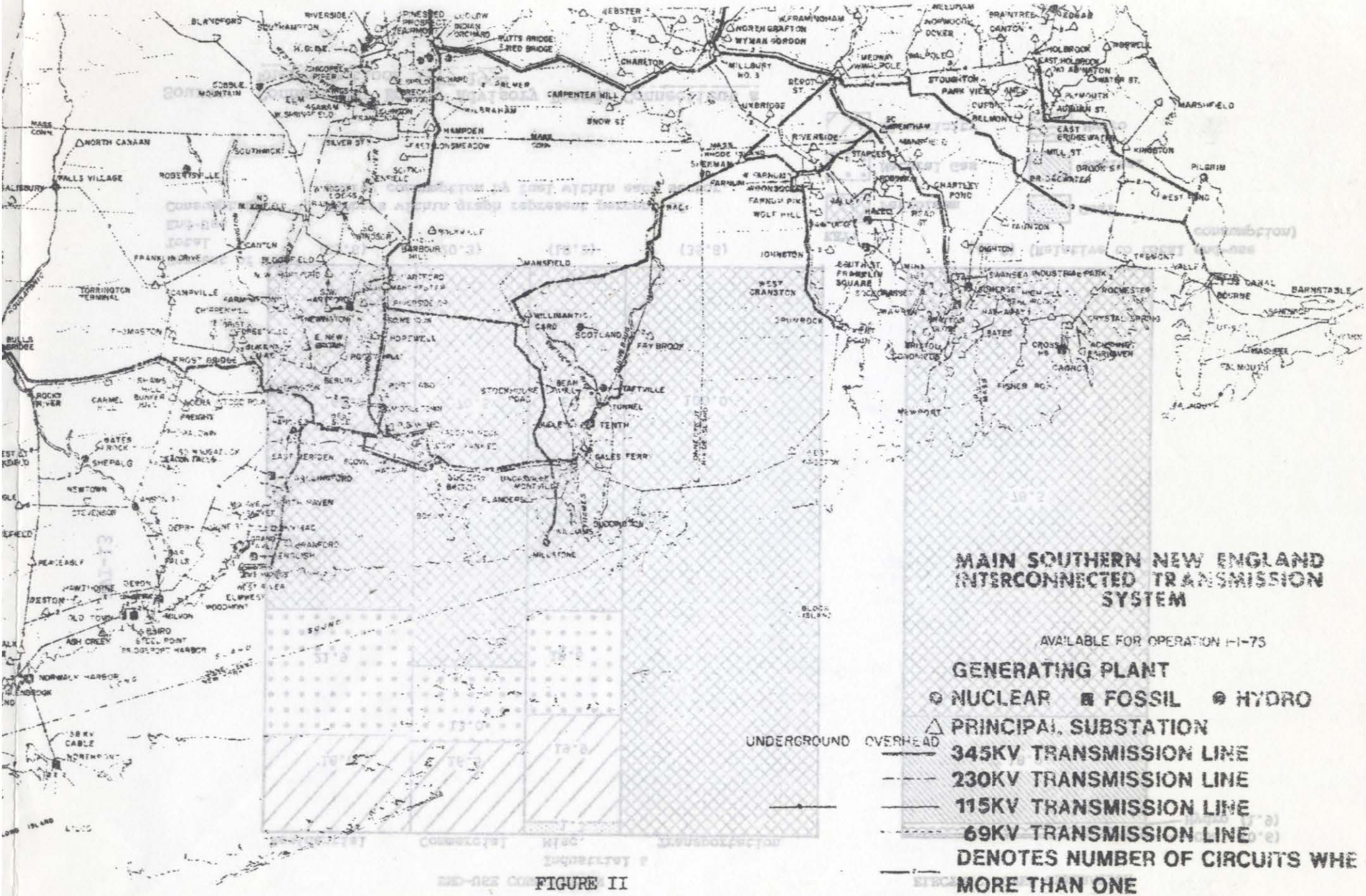

MAIN SOUTHERN NEW ENGLAND INTERCONNECTED TRANSMISSION SYSTEM
AVAILABLE FOR OPERATION 1-1-75
GENERATING PLANT
NUCLEAR
FOSSIL
HYDRO
PRINCIPAL SUBSTATION
UNDERGROUND
OVERHEAD
345KV TRANSMISSION LINE
230KV TRANSMISSION LINE
115KV TRANSMISSION LINE
69KV TRANSMISSION LINE
DENOTES NUMBER OF CIRCUITS WHE
MORE THAN ONE

FIGURE II

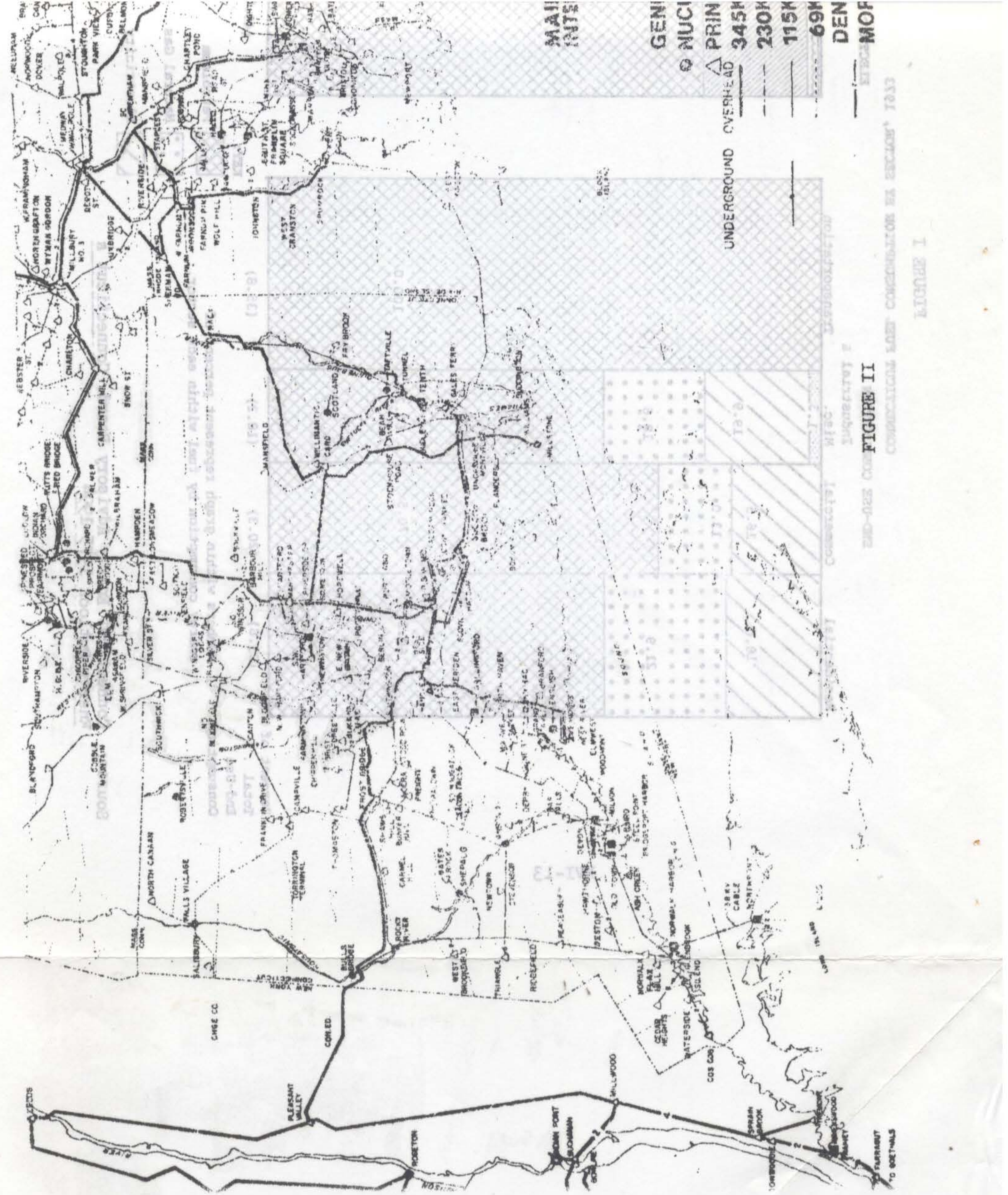


FIGURE II

TABLE I

Fuels and Heating Equipment Utilized by Households: 1960 and 1970

Waterbury SMSA*

	1960	1970	Percent Change 1960-1970
All Occupied Housing Units	54,239	64,662	19.2
House Heating Fuel			
utility gas	8,741	16,851	92.8
fuel oil, kerosene, etc.	41,000	43,403	5.9
electricity	158	2,958	1,772.2
bottled gas	1,435	946	-34.1
coal or coke	2,455	128	-94.8
other fuel	374	249	-33.4
none	76	127	67.1
Water Heating Fuel			
utility gas	21,063	23,787	12.9
electricity	8,128	14,777	81.8
coal or coke	427	21	-95.1
bottled gas	4,402	2,118	-51.9
fuel oil, kerosene, etc.	17,839	23,403	31.2
other fuel	201	72	-64.2
none	2,179	484	-77.8
Cooking Fuel			
utility gas	27,853	26,359	-5.4
electricity	16,978	31,866	87.7
bottled gas	7,986	5,351	-33.0
fuel oil, kerosene, etc.	872	712	-18.3
coal or coke	150	111	-26.0
other fuel	189	33	-82.5
none	211	230	9.0

*The Standard Metropolitan Statistical Area includes all the municipalities of the Region except Bethlehem, Oxford and Southbury.

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Housing, 1960 State and Small Areas, 1970: Detailed Housing Characteristics.

TABLE II

Appliances and Automobiles Owned by Households: 1960 and 1970

Waterbury SMSA*

	1960	1970	Percent Change 1960-1970
All Occupied Housing Units	54,239	64,662	19.2
Clothes Washing Machine			
Yes	45,886	52,490	14.4
No	8,353	12,172	
Clothes Dryer			
Gas heated	381	1,937	408.4
Electric heated	6,076	23,336	284.1
None	47,782	39,389	
Dishwasher			
Yes	--	11,827	--
No	--	52,835	
Home Food Freezer			
Yes	5,217	12,829	145.9
No	49,022	51,833	5.7
Air Conditioning **			
1 Room unit	1,677	9,934)	
2 or more room units	383	4,007)	492.4
Central System	166	1,178)	
None	52,013	51,995	
Television Sets			
One set	45,455	43,999)	
Two sets or more	5,246	19,101)	24.5
None	3,538	1,562	
Automobiles Available			
One	31,625	28,556)	
Two	10,981	21,647)	24.3
Three or more	1,117	4,152)	
None	10,516	10,087	

*The Standard Metropolitan Statistical Area includes all of the municipalities of the Region with the exception of Bethlehem, Oxford and Southbury.

**Information on Air Conditioning is for the entire CNV Region.

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Housing, 1960: State and Small Areas, 1970: Detailed Housing Characteristics.

TABLE III

Occupied Housing Units with Selected Electrical Appliances by Income Level in the Waterbury SMSA: 1970
(5% sample)

Appliance	Under $3,000	$3,000 $4,999	$5,000 $6,999	$7,000 $9,999	$10,000 $14,999	$15,000 $24,999	$25,000+	Total
	Number of Appliances by Income							
Automatic Clothes Washing Machine	4,038	2,955	3,565	9,197	15,465	9,466	3,094	47,780
Clothes Dryer	1,152	918	944	4,032	3,129	6,534	2,575	25,273
Dishwasher	610	331	291	1,200	3,871	3,486	2,038	11,827
Home Food Freezer	664	396	550	1,998	4,541	3,254	1,464	12,829
Air Conditioner*	880	613	1,042	2,496	4,818	3,650	1,243	14,742
	Percentage Distribution by Income							
Automatic Clothes Washing Machine	51.3	56.6	55.3	75.1	84.3	82.7	107.7	74.1
Clothes Dryer	14.6	17.6	14.6	32.9	17.0	57.1	89.6	39.2
Dishwasher	7.8	6.3	4.5	9.8	21.1	30.4	70.9	18.3
Home Food Freezer	8.4	7.6	8.5	16.3	24.7	28.4	50.9	19.9
Air Conditioner	11.2	11.7	16.2	20.3	26.2	31.9	43.3	22.8

*15% Sample

SOURCE: Bureau of the Census, 1970 Census of Housing, Metropolitan Housing Characteristics, Waterbury, Conn. SMSA, HC(2)-233

TABLE IV

Approximate Wattage Rating and Estimated Annual Kwh Consumption of Electric Appliances - Assuming Normal Use

	Average Wattage	Est. Kwh Consumed Annually
food preparation		
Blender	386	15
Broiler	1,436	100
Carving Knife	92	8
Coffee Maker	894	106
Deep Fryer	1,448	83
Dishwasher	1,201	363
Egg Cooker	516	14
Frying Pan	1,196	186
Hot Plate	1,257	90
Mixer	127	13
Oven, microwave (only)	1,450	190
Range with oven	12,200	1,175
Range with self-cleaning oven	12,200	1,205
Roaster	1,333	205
Sandwich Grill	1,161	33
Toaster	1,146	39
Trash Compactor	400	50
Waffle Iron	1,116	22
Waste Disposer	445	30
food preservation		
Freezer (15 cu ft)	341	1,195
Freezer (Frostless 15 cu ft)	440	1,761
Refrigerator (12 cu ft)	241	728
Refrigerator (Frostless 12 cu ft)	321	1,217
Refrigerator/Freezer (14 cu ft)	326	1,137
Refrigerator (Frostless 14 cu ft)	615	1,829
laundry		
Clothes Dryer	4,856	993
Iron (hand)	1,008	144
Washing Machine (automatic)	512	103
Washing Machine (non-automatic)	286	76
Water Heater	2,475	4,219
Water Heater (quick-recovery)	4,474	4,811
comfort conditioning		
Air Cleaner	50	216
Air Conditioner (room)	860	860
Bed Covering	177	147
Dehumidifier	257	377
Fan (attic)	370	291
Fan (circulating)	88	43
Fan (rollaway)	171	138
Fan (window)	200	170
Heater (portable)	1,322	176
Heating Pad	65	10
Humidifier	177	163
health & beauty		
Germicidal Lamp	20	141
Hair Dryer	381	14
Heat Lamp (infrared)	250	13
Shaver	14	1.8
Sun Lamp	279	16
Tooth Brush	7	0.5
Vibrator	40	2
home entertainment		
Radio	71	86
Radio/Record Player	109	109
Television - black & white tube type	160	350
Television - black & white solid state	55	120
Television - color tube type	300	660
Television - color solid state	200	440
housewares		
Clock	2	17
Floor Polisher	305	15
Sewing Machine	75	11
Vacuum	630	46

National averages as prepared by the Electric Energy Association

TABLE B

SOURCE: Edison Institute

Table V

PUBLIC UTILITIES SUPPLYING ELECTRIC, GAS AND WATER SERVICE
TO CNVR MUNICIPALITIES AS OF DECEMBER 31, 1974

Service Area	Name of Utility	Number of Customers		
		Gas	Electric	Water
Beacon Falls.....	Seymour Water Company	-	-	413
	Conn. Light & Power Co.	6	1408	-
	Conn. Water Co.	-	-	58
Bethlehem.....	Watertown Fire District, Water Department	-	-	3
	Conn. Light & Power Co.	-	898	-
Cheshire.....	Southington, Town of, Water Department	-	-	58
	Conn. Light & Power Co.	569	6508	-
	Wallingford, Town of, Electric Department	-	21	-
	New Haven Water Company	-	-	3665
	Meriden, City of, Water Department	-	-	15
Middlebury.....	Westover School, Inc.	-	-	1
	Westover Water Company	-	-	33
	Hillcrest Fire District, Water Department			52
	Conn. Light & Power Co.	15	2100	-
	Waterbury, City of, Water Department	-	-	1
Naugatuck.....	Conn. Light & Power Co.	3920	9247	-
	Conn. Water Company			5235
	Indian Field Co.	-	-	303
Oxford.....	Seymour Water Co.			46
	Conn. Light & Power Co.	120	1959	-
Prospect.....	Conn. Light & Power Co.	1	2050	-
Southbury.....	Conn. Light & Power Co.	-	5919	-
	Heritage Village Water Co.	-	-	1777
	American Realty Investment Co.	-	-	112
Thomaston.....	Thomaston Water Co.	-		793
	Hartford Electric Light Co.	-	2240	-
	Conn. Light & Power Co.	780	7	-
	Waterbury, City of Water Department	-	-	2
Waterbury.....	Waterbury, City of Water Department			23283
	Conn. Light & Power Co.	23,730	39,976	-
	Conn. Gas Co.	1	-	-
	Conn. Water Co.		-	(Platt's Mill) 96

Table V*

PUBLIC UTILITIES SUPPLYING ELECTRIC, GAS AND WATER SERVICE TO CNVR MUNICIPALITIES AS OF DECEMBER 31, 1974

(continued)

Service Area	Name of Utility	Number of Customers		
		Gas	Electric	Water
Watertown.....	Waterbury, City of Water Department	-	-	16
	Watertown Fire District, Water Department	-	-	1493
	Hartford Electric Light Company	-	6	-
	Conn. Light & Power Co.	1917	6507	-
	Oakville Fire District, Water Department	-	-	2160
Wolcott.....	Conn. Light & Power	49	4182	-
Woodbury.....	Woodbury Water Company	-	-	419
	Conn. Light & Power Co.	1	2835	-

SOURCE: In house Report of the Public Utilities Commission, State of Conn., 1974 and 1975.

*Water figures listed as of December 31, 1973.

Table VI

ENERGY CONSUMPTION - 12 MONTH PERIOD

	Number Elec. Meters	kWH Consumption	Average Customer Consumption	Percent Total	Number of Gas Meters	Mcf Consumption	Average Customer Consumption	Percent Total
RESIDENTIAL	86,252	635,503	7.367	41.7	30,247	2,358,071	77.96	45.1
COMMERCIAL	8,865	350,837	39.575	23.0	2,306	809,759	351.153	15.4
INDUSTRIAL	668	522,229	781.779	34.3	244	2,057,774	8,433.50	39.3
STREET LIGHTING	24*	12,426	517.75	.008				
		1,520,995		100%		5,225,604		100%

Source: Energy Consulting Services of CL&P, May 9, 1975.

*Street Lighting for all 24 towns.

Table VII

1974 - 1975

ENERGY CONSUMPTION - 12 MONTH PERIOD (MARCH TO MARCH)

	Number of Electric Meters	kWH Consumption	Average Customer Consumption	Number Of Gas Meters	Mcf Consumption	Average Customer Consumption
RESIDENTIAL						
Waterbury District[1]	62,951	466,108	7.40	24,551	1,894,115	77.15
Naugatuck District[2]	17,818	132,243	7.42	3,815	286,194	75.02
Winsted District[3]	5,483	37,152	6.78	1,881	177,762	94.50
	86,252	635,503	7.40	30,247	2,358,071	77.96
COMMERCIAL						
Waterbury District	6,809	284,663	41.81	1,919	711,640	370.84
Naugatuck District	1,434	47,529	33.14	283	77,284	273.09
Winsted District	622	18,645	29.98	104	20,735	199.38
	8,865	350,837	39.57	2,306	809,759	351.15
INDUSTRIAL						
Waterbury District	510	329,165	645.42	199	1,730,936	8,698.2
Naugatuck District	84	163,402	1945.26	23	179,874	7,820.6
Winsted District	74	29,662	400.84	22	146,964	6,680.2
	668	522,229	517.75	244	2,057,774	8,433.5

WATERBURY DISTRICT[1]

Middlebury
Plymouth*
Prospect
Southbury
Thomaston*
Watertown
Waterbury

NAUGATUCK DISTRICT[2]

Beacon Falls
Bethany
Naugatuck
Oxford
Seymour

WINSTED DISTRICT[3]

Barkhamsted (part)
Bethlehem
Colebrook
Cornwall
Goshen
Hartland (part)
Harwinton
Litchfield
Morris
Winchester
Winsted
Wolcott
Woodbury

*Gas only.

Source: Energy Consulting Services of CL&P, May 9, 1975.

Table VIII

ELECTRICAL SUBSTATIONS WITHIN THE CENTRAL NAUGATUCK VALLEY REGION: 1975

LOCATION	MUNICIPALITY	SIZE OF TRANSMISSION LINE
Beacon Falls	Beacon Falls	115 KiloVolt
Southern Naugatuck	Naugatuck	115 KiloVolt
Bates Rock	Southbury	115 KiloVolt
Thomaston	Thomaston	115 KiloVolt
Frost Bridge	Watertown	345 KiloVolt
Shaws Hill	Watertown	115 KiloVolt
Baldwin Street	Waterbury	115 KiloVolt
Bunker Hill	Waterbury	115 KiloVolt
Chase	Waterbury	115 KiloVolt
Freight Street	Waterbury	115 KiloVolt
Noera Tap	Waterbury	115 KiloVolt
Todd	Waterbury	115 KiloVolt
Carmel Hill	Woodbury	69 KiloVolt

Source: Northeast Utilities System Ten Year Forecasts of Loads and Resources 1975-1984, January 1, 1975.

Table IX

Automobiles Available to Households in CNVR, by Municipality: 1970
(Based on 20% Sample)

Municipality	Total	No Car	At Least One Car	At Least Two Cars	At Least Three Cars
	Number of Households				
CNVR	68,369	10,214	58,155	27,927	4,505
Waterbury	34,921	7,989	26,932	10,472	1,527
Remainder of Region	33,448	2,225	31,223	17,455	2,978
Beacon Falls	1,071	85	986	517	99
Bethlehem	601	30	571	302	56
Cheshire	5,291	203	5,088	3,221	489
Middlebury	1,666	97	1,569	1,052	243
Naugatuck	7,243	837	6,406	2,722	454
Oxford	1,311	33	1,278	887	203
Prospect	1,765	44	1,722	1,096	187
Southbury	2,019	68	1,951	939	94
Thomaston	1,883	203	1,680	832	77
Watertown	5,393	379	5,014	2,800	564
Wolcott	3,316	146	3,170	1,961	295
Woodbury	1,892	104	1,788	1,126	217
	Percentage Distribution				
CNVR	100.0	14.9	85.1	40.8	6.6
Waterbury	100.0	22.9	77.1	30.0	4.4
Remainder of Region	100.0	6.7	93.3	52.2	8.9
Beacon Falls	100.0	7.9	92.1	48.3	9.2
Bethlehem	100.0	5.0	95.0	50.2	9.3
Cheshire	100.0	3.8	96.2	60.9	9.2
Middlebury	100.0	5.8	94.2	63.1	14.6
Naugatuck	100.0	11.6	88.4	37.6	6.3
Oxford	100.0	2.5	97.5	67.7	15.5
Prospect	100.0	2.5	97.6	62.1	10.6
Southbury	100.0	3.4	96.6	46.5	4.7
Thomaston	100.0	10.8	89.2	44.2	4.1
Watertown	100.0	7.0	93.0	51.9	10.5
Wolcott	100.0	4.4	95.6	59.1	8.9
Woodbury	100.0	5.5	94.5	59.5	11.5

Source: U.S. Bureau of the Census, Census of Population and Housing: 1970, Census Tracts. Final Report PHC (1)-227 Waterbury, Connecticut SMSA.

XVI. OBJECTIVES AND POLICIES - Energy

GOAL: To conserve scarce fuels and promote the use of more permanent and economical energy sources without adversely affecting the social and economic health of the Region or endangering the quality of the environment.

OBJECTIVE I: To reduce the energy used to heat residential housing units.

Policy I.1: To provide incentives for the insulation of existing residential housing units.

Policy I.2: To revise building codes to include improved insulation, ventilation and lighting standards.

Policy I.3: To increase the efficiency of space heating in the residential and commercial sectors by requiring mandatory maintenance of heating systems.

Policy I.4: To encourage the reduction of energy consumption for residential and commercial heating and cooling equipment and appliances by requiring retail labeling and mandatory performance standards on appliance efficiency.

Policy I.5: To support the use of solar energy for hot water heating and space heating and cooling in the home.

Policy I.6: To increase the efficiency of space heating and cooling by encouraging multi-family development.

OBJECTIVE II: Gradually reduce dependence on scarce fuels and/or imported fuels -- oils and natural gas.

Policy II.1: To encourage the use of nuclear powered electric generating plants having adequate environmental safeguards within Connecticut.

OBJECTIVE III: To encourage industrial energy conservation.

Policy III.1: To encourage large companies in each industry to develop and implement plans for reducing energy consumption and to submit their plans to the State.

Policy III.2: To reduce industrial energy demands by encouraging energy efficient concentrations of industry in close proximity to electric power generating plants.

Policy III.3: To encourage the state to provide financial incentives to companies that invest in capital equipment to enable recovery of waste heat.

Policy III.4: To encourage the state and federal governments to provide financial incentives to companies that invest in energy conserving processes.

Policy III.5: To encourage industry to recycle waste products when it proves to offer energy cost and environmental benefits to the firm.

Objective IV: To reduce and more efficiently utilize the energy consumed by the transportation sector.

Policy IV.1: To provide incentives for carpooling.

Policy IV.2: To improve vehicle flow during peak traffic hours.

Policy IV.3: To encourage bicycling and walking in all areas of the Region.

Policy IV.4: To encourage the State to require periodic engine efficiency inspections of all motor vehicles.

Policy IV.5: To improve commuter intra and inter-city public transit.

Standard IV.5.1: To reduce bus fares in conjunction with programs designed to increase the cost of urban motor vehicle use (e.g., higher parking fees, increased taxes on automobiles, etc.).

Policy IV.6: To encourage the state to make automobile purchase taxes inversely proportional to fuel economy (e.g., engine displacement).

Policy IV.7: To encourage the institution of parking taxes in the urban centers of the Region.

Policy IV.8 To support present research in automotive technology oriented to reducing energy consumption.

Policy IV.9: To encourage the use of railroads for the movement of freight into and out of the Region.

OBJECTIVE V. To develop new energy sources and to more efficiently utilize the existing sources of energy provided to the Region.

Policy V.1: To encourage the State to utilize solid waste as an energy source in the generation of electricity.

Policy V.2: To encourage the State to provide incentives for investments in low BTU coal gasification facilities in order to reduce reliance on oil and natural gas.

Policy V.3: To encourage the use of geothermal, fuel cells and wind as sources of energy.

Policy V.5: To encourage efforts to save fuel by reducing peak loads of electrical generation.

Standard V.4.1: To encourage rate structures designed to reduce peak period use of electricity.

OBJECTIVE VI: To inform the Region's residents regarding means of conserving energy.

Policy VI.1: The Energy Coordinators in each municipality of the Region are encouraged to develop and monitor programs designed to reduce energy consumption within their municipality.

Policy VI.2: Schools within the Region are encouraged to provide energy usage education as part of the standard curriculum.

OBJECTIVE VII: To encourage land use patterns which promote higher density development and reduced travel distances within the Region.

Policy VII.1: To encourage clustering of residential housing in conjunction with mixed use development in each municipality of the Region.

Policy VII.2: To integrate residential and employment sites through provisions of mixed zoning regulations.

Policy VII.3: To encourage development to be at sufficient densities for the economic use of services within the Region.

Policy VII.4: To encourage industrial and residential development in close proximity to existing or proposed electrical generating plants in order to take advantage of the waste heat produced by the generating plant.

OBJECTIVE VIII: To ensure that fuel for home heating, home utilities and private automobiles is available to all residents of the Region.

Policy VIII.1: To encourage the State and federal governments to provide emergency loans to low income people suffering from the high cost of energy.

BIBLIOGRAPHY

1. American Nuclear Society, Nuclear Power and the Environment, 1973, Hinsdale, Illinois.

2. Bacher, Ken, Putting the Sun to Work. Arizona State Fuel and Energy Office, 1624 West Adams, Phoenix, Arizona 85007, 1974.

3. Brumbach, Joseph J., The Climate of Connecticut, State Geological and Natural History Survey of Connecticut, Bulletin No. 99, 1965.

4. Connecticut Energy Advisory Board, Connecticut's Energy Outlook 1975-1994, January 15, 1975.

5. Council on Environmental Quality, Energy and the Environment, August, 1973, U.S. Government Printing Office, Washington, D.C.

6. Daniels, Farrington, Direct Use of the Sun's Energy, Ballantine, 1974.

7. Energy Research and Development Administration, Division of Solar Energy, National Plan for Solar Heating and Cooling - Residential and Commercial Applications - Interim Report. Washington, D.C., 1975.

8. Energy Policy Project of the Ford Foundation, Exploring Energy Choices, 1974, The Ford Foundation, New York, New York.

9. Federal Energy Administration, Project Independence Blueprint Final Task Force Report - Solar Energy, 1974.

10. Federal Energy Office, Mandatory Petroleum Allocation Summary, as abstracted from the Federal Register, January 15, 1974.

11. Halacy, D. S., The Coming Age of Solar Energy, Avon, 1973.

12. The Hartford Courant, "Solar Heating System Slices Astronomical Home Costs", May 13, 1975, p. 1.

13. Chan, D. C., Residential Energy Consumption and Small-Scale Options of Energy Systems for Space Heating. MITRE Corporation, Bedford, Mass., 1974.

14. Solar Energy as a National Energy Resource, prepared by the National Science Foundation Solar Energy Panel. NSF/RA/N-73-001. 1972.

15. Northeast Utilities System, Annual Report 1973.

16. Northeast Utilities System, Ten Year Forecast of Loads and Resources 1975-1984, January 1, 1975.

17. NOW, Incorporated, Those Who Pay for Heat and Utilities, Unpublished document, 1975, Waterbury, Connecticut.

18. Peterson, James T., The Climate of Cities: A Survey of Recent Literature, U.S. Department of Health Education and Welfare, Public Health Service, National Air Pollution Control Administration, Raleigh, North Carolina, October, 1969, U.S. Government Printing Office, Washington, D.C.

19. Energy Primer: Solar, Water, Wind and BioFuels. Portola Institute, 558 Santa Cruz Avenue, Menlo Park, California 94025.

20. Regional Plan Association, Inc. and Resources for the Future, Inc., Regional Energy Consumption, 1974, New York.

21. Rumney, Susan, There's A Bright Future in Store, unpublished document of Connecticut Energy Agency, April 1, 1975.

22. Shurcliff, W. A., Solar Heated Buildings - A Brief Survey, 7th Edition, 19 Appleton Street, Cambridge, Massachusetts 02138, 1975.

23. Stepler, Richard, "Solar Heating Equipment", Popular Science, 1975.

24. Tri-State Regional Planning Commission, Quo Vadis Energy Policy: An Inventory of Supply Options, August, 1974.

25. _____, Meeting the Region's Growing Demand for Electric Power, October, 1971.

26. _____, Energy Saving Transportation Plan, June, 1974.

27. _____, The Economics of Energy, February, 1974.

28. _____, Historical Trends in Electric Energy and Fossil Fuels, 1973, December, 1974.

29. _____, Strategies for Reduced Transportation System Energy Consumption, December, 1974.

30. U.S. Department of Transportation, Federal Highway Administration, Office of Highway Planning, Highway Statistics Division, Cost of Operating an Automobile, April, 1974.

31. U.S. Environmental Protection Agency, Energy Conservation Strategies, July, 1973, U.S. Government Printing Office, Washington, D.C.

32. _____, 1974 Gas Mileage Guide for Car Buyers, February, 1974, U.S. Government Printing Office, Washington, D.C.

33. Urban Mass Transportation Administration, U.S. Department of Transportation, Guidelines to Reduce Energy Consumption Through Transportation Actions, May, 1974, Washington, D.C.

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